Bankway®
Network Standards Guide - Distributed Terminal Server in Every Branch

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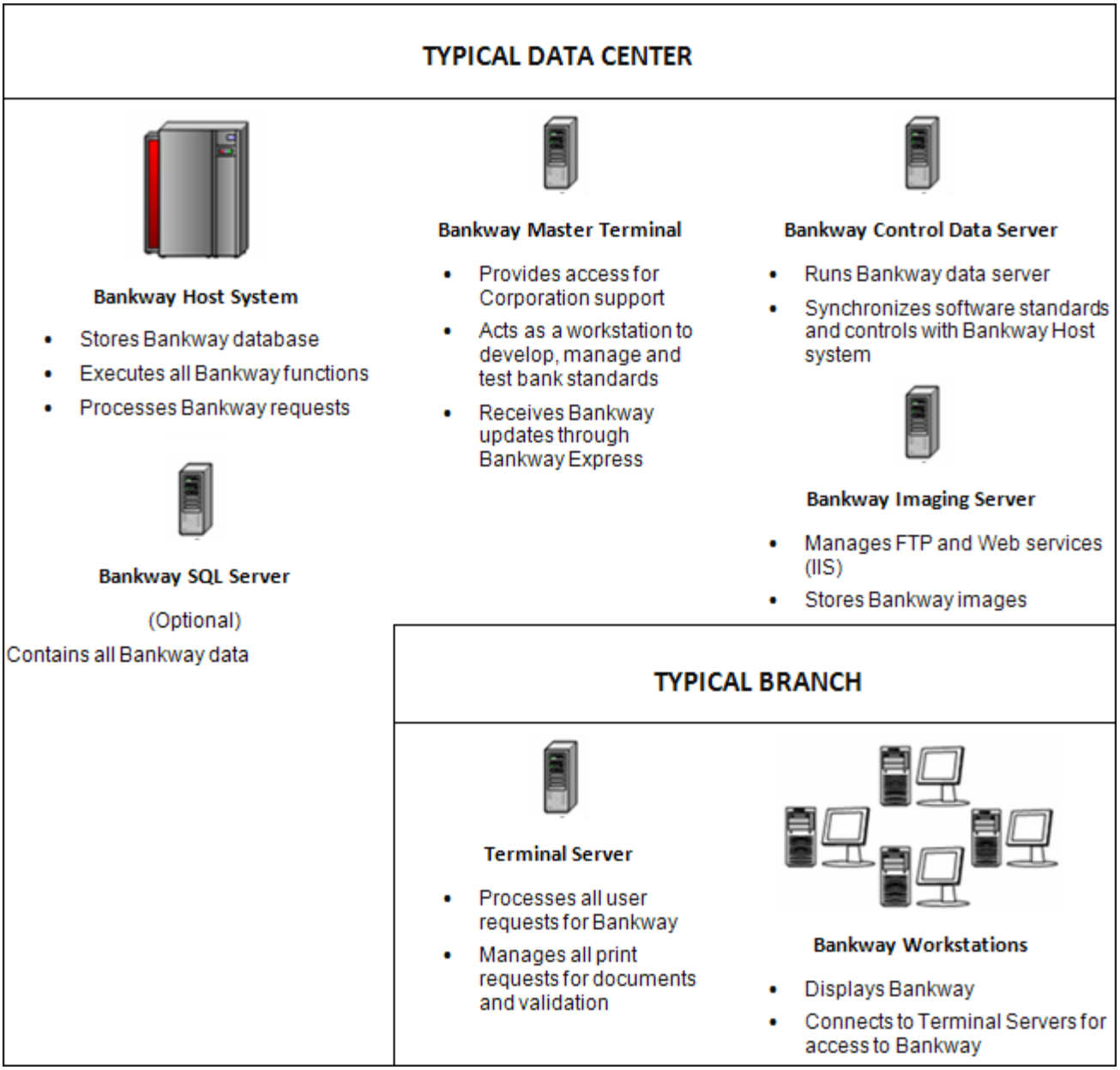
Bankway Network Standards Guide - Distributed Terminal Server in Every Branch

Bankway Overview

The Windows environment of Bankway provides your bank with streamlined customer service efficiencies. With these time saving and easy-to-use capabilities, your bank's employees can perform their tasks quickly and efficiently as well as provide a superior level of customer service.

Bankway Environment

FIS has enhanced the capabilities of Bankway to support Windows®-compliant access to the information in Bankway. The high-level illustration below provides the basic components of the Bankway environment.


TYPICAL DATA CENTER
Bankway Host System
Stores Bankway database
Executes all Bankway functions
Processes Bankway requests
Bankway SQL Server
(Optional)
Contains all Bankway data
Bankway Master Terminal
Provides access for Corporation support
Acts as a workstation to develop, manage and test bank standards
Receives Bankway updates through Bankway Express
Bankway Control Data Server
Runs Bankway data server
Synchronizes software standards and controls with Bankway Host system
Bankway Imaging Server
Manages FTP and Web services (IIS)
Stores Bankway images
TYPICAL BRANCH
Terminal Server
Processes all user requests for Bankway
Manages all print requests for documents and validation
Bankway Workstations
Displays Bankway
Connects to Terminal Servers for access to Bankway

Purpose and Organization of the Guide

The purpose of the *Bankway Network Standards Guide* is to provide the network standards and specifications recommended by FIS. Please contact FIS Hardware and Network Services

division for assistance with specific hardware requirements to ensure a successful implementation of Bankway at your bank.

The *Bankway Network Standards Guide for Terminal Server in Each Branch Environment* provides detailed information on the following topics:

- Terminal Services Overview
- Bankway Master Terminal
- Bankway Image Server
- Bankway SQL Server
- Bankway Terminal Server
- Bankway Thin Client
- Bankway PC Workstation
- Host Requirements (OS/390, AS/400 and UNIX)
- Telecommunications Network
- Printers
- Scanners and Web Cams
- Sample Configurations
- Benefits and Challenges – Terminal Server at Each Branch
- Benefits and Challenges – SQL Server™
- Items to be Completed Before the Installation of Bankway
- Networking Solutions
- Terminal Server Application Standards
- Terminal Server User Policy Standards

Conformance to Network Standards

The network standards provided in this guide are required and must be certified prior to the implementation of Bankway at your bank. Included in the guide are the minimum and/or suggested configurations for this implementation. As individual bank networks and applications may vary, please review these standards with your bank's designated network vendor and FIS. Your bank's network vendor is responsible for researching and implementing any additional requirements for your environment, such as new applications, security requirements and so on.

> ***Note:*** *These standards are dynamic in nature and are subject to additions, changes, and deletions as both software and hardware technologies advance. Please contact your FIS account executive to ensure that you have the most current information.*

Printer Support and Peripheral Devices

The versatile design of Bankway provides report-printing capabilities (using shared network printers) and receipt-printing capabilities (using receipt printers/peripheral computer devices). These devices allow your bank to take full advantage of the next-generation customer service capabilities of Bankway.

Terminal Services Overview

Microsoft® Windows Server 2003 provides the capability to render 32-bit Microsoft Windows-based applications to thin client terminals and terminal emulators running on PC and non-PC desktops. The terminal server environment is a thin client architecture, where all application processing occurs centrally on the server. Because terminal emulator clients are available for many different desktop platforms (Macintosh, UNIX, and others), Terminal Services provides access to 32-bit Windows®-based applications from virtually any desktop.

What is Windows Terminal Server

This section is an excerpt from Microsoft's *Terminal Server Architecture* by Gavin Carius and Craig Cumberland

Microsoft® Terminal Server adds Microsoft Windows-based terminal support to the Microsoft Windows Server operating system and a "super thin client" to the Windows operating system family product line. This new technology provides enterprise customers with a compelling extension to the Windows computing environment that combines low total cost of ownership, the familiar 32-bit Windows user interface, and the power and choice of the Windows operating system family.

In the multi-user Windows Server environment, a "super thin client" allows users to run the Windows desktop operating system and Windows-based applications completely off the server. Windows Server 2003 will provide users access to 32-bit Windows-based applications from any of the following types of desktops:

- A class of low-cost hardware commonly referred to as Windows-Based Terminals that will be marketed by third-party hardware vendors
- Any existing 32-bit Windows desktop operating system, such as Windows 2000 Professional, or Windows XP
- X-based Terminals, Apple Macintosh, networked computers, and UNIX-based desktops (through a third-party add-on product)

Product Overview

This section is an excerpt from Microsoft's *Terminal Server Architecture* by Gavin Carius and Craig Cumberland

Microsoft Windows Server 2003, Terminal Services consists of three components – the Windows Server multi-user core, the Remote Desktop Protocol (RDP), and the "super thin"

Windows-based client software. In addition to the base components, Citrix MetaFrame 1.8 or Citrix MetaFrame XP is required to provide support for the low bandwidth ICA protocol and thin client serial and parallel port support.

Specifically:

- **Windows Terminal Server** – A multi-user server core that provides the ability to host multiple, simultaneous client sessions on Microsoft® Windows Server 2003, and on future versions of Windows server systems. Windows Terminal Server is capable of directly remoting a 32-bit Windows-based desktop to a variety of Windows-based and non-Windows-based hardware. Standard Windows-based applications do not need modification to run on the Windows Terminal Server, and almost all Windows-based management infrastructure and technologies can be used to manage the client desktops. Therefore, Corporations can take advantage of the many choices of applications and tools offered by today's Windows environment.
- **Remote Desktop Protocol (RDP)** – A key component of Windows Terminal Server is the protocol that allows a "super thin client" to communicate with the Windows Terminal Server over the network. This protocol is based on International Telecommunications Union's (ITU) T.120 protocol, an international-standard multi-channel conferencing protocol currently used in the Microsoft NetMeeting™ conferencing software product. It will also support encrypted sessions.
- **"Super Thin" Client** – The client software that presents, or remotes, the familiar 32-bit Windows user interface to a range of the following desktop hardware:
  - New Windows-based Terminal devices based on Windows CE
  - Personal computers running and Windows operating systems
- **Citrix MetaFrame** – A third-party software product that extends the functionality of the base terminal server product in such areas as bandwidth utilization, session shadowing and improved attached device support.

Terminal Server Licensing

Terminal Server licensing differs from regular Windows licensing and must be closely monitored. There are four types of licenses that must be purchased in a Citrix and Terminal Services environment.

- **Client Access Licenses** – Every user accessing the Windows Terminal Server must have a standard Windows Client Access License (CAL).
- **Terminal Server Access Licenses** – An additional Terminal Server Client Access License (TSCAL) is required for every user who will use the terminal server.
- **Citrix MetaFrame Licenses** – There must be a MetaFrame License for every user with concurrent access to the terminal server.
- **Software / Applications Licenses** – Each software application on the terminal server must have a valid license for every concurrent user of that application.

Note: *Contact your Account Manager for more information and for current pricing.*

Bankway Master Terminal

The Bankway master terminal has several purposes:

- FIS Support access
- Test / Training Environment
- FIS Express Server
- Configuration Console and Master Configuration
- Bank Standards Configuration and Distribution

By using an Internet connection, the Master Terminal allows FIS to connect to your network. By allowing a connection to your network, FIS is able to perform software installations, assist with updates, and provide technical support. Please consult the Remote Desktop Sharing guide for more information.

> ***Note:*** *A modem and a dedicated telephone line may be used in lieu of the Internet connection. Please consult your Network Certification Specialist for more information.*

The Master Terminal can be used as the server in a test / training environment. By only attaching test / training workstations to the Master Terminal, any changes made to this server will not affect your production environment.

FIS Express automatically downloads updates from the FIS Express Server. This service requires a constant, high-speed Internet connection.

The Master Terminal should be used to maintain a master configuration for all servers and workstations. By installing the FIS Configuration Console on the Master Terminal, changes to Bankway dependent settings can be centrally managed for all of the branch servers and workstations.

The Master Terminal should be used to configure and distribute any Bank Standards changes. A teller receipt printer should be attached to the Master Terminal throughout the Implementation process.

FIS recommends that each bank in a data center environment have its own master terminal located at its central operations center in order to maintain control over the bank's standards.

> ***Note:*** *The Master Terminal is not a terminal server. It must be in a physically accessible location and will be used extensively during the implementation process.*

Recommended Hardware Configuration

The following information summarizes the Recommended Hardware Configuration for the installation of Bankway.

- Pentium® 4 – 2.0 GHz Processor or higher

- 512 MB Random Access Memory (RAM)
- 15 GB free (usable) hard-drive space
- 1.44 MB Floppy drive
- CD-ROM Drive
- SVGA Monitor (required resolution of 800 x 600 pixels) with 256 color resolution
- 100 Mbps Ethernet Card
- Uninterruptible Power Supply (UPS) with telephone-line surge protection
- Internal Tape Backup (Optional)
- Keyboard
- Mouse

Software Requirements

The following information summarizes the minimum software requirements for the installation of Bankway.

- Microsoft® Windows® Server 2003
- Bankway Service Level CD
- Bankway Express Site Manager CD
- Microsoft® Office 2003 for document printing
- IBM® Personal Communications for Windows®, IBM Client Access, or equivalent terminal emulation (for the IBM AS/400 and MVS environments)
- UniKix-supplied terminal emulation (for UNIX environments)

To ensure that the test environment does not impact the production environment, the SQL Express upgrade to MSDE must be installed on the Master Terminal. The MSDE installer is included on the Bankway CD in the Special Installation folder.

> ***Note:*** *Terminal emulation software is not required for the operation of Bankway Windows-based capabilities. It is used to access legacy Bankway functions, also known as Green Screens.*

Software Recommendations

- Tape Backup Software
- Virus Scanning Software

> ***Note:*** *FIS recommends Mcafee® VirusScan® or Norton AntiVirus™.*

Bankway Image Server

The Bankway Image Server is used to store your customer images. These images can be signature cards, photo identifications or any other image you wish to store. The Image Server will typically be located at the main office or data center.

> ***Note:*** *The Image Server should be dedicated to the processing and storage of Bankway images for the entire Bank.*

Recommended Hardware Configuration

The following information summarizes the Recommended Hardware Configuration for the installation of Bankway imaging capabilities.

- Pentium® 4 – 2.0 GHz Processor or higher
- 512 MB Random Access Memory (RAM)
- SCSI hard drive controller using RAID 5 (disk striping)
- 20 GB free (usable) hard drive space
- 1.44 MB Floppy drive
- CD-ROM Drive
- SVGA Monitor (minimum resolution of 800 x 600 pixels) with 256 color resolution
- 100 Mbps Ethernet Card
- Internal Tape Backup (Required)
- Uninterruptible Power Supply (UPS) with surge protection
- Keyboard
- Mouse

Software Requirements

The following information summarizes the software requirements for the installation of Bankway imaging capabilities:

Microsoft Windows Server 2003

Note: *Internet Information Services is included on the Windows Server 2003 CD.*

Software Recommendations

- Tape Backup Software
- Virus Scanning Software
- Uninterruptible Power Supply (UPS) safe shutdown software for power-loss management

Note: *FIS recommends McAfee VirusScan or Norton AntiVirus.*

Statements Server

The Bankway Statements Server is used to render statement documents. The server operates on a stand-alone basis, creating and accumulating statements as a batch process. The server responds to the Bankway business task to request viewing of an archived statement, as well as Business Tasks for administration and maintenance.

It is strongly recommended that an appropriately configured server be dedicated to the Statements Server role. If other applications must operate on the server, they should be scheduled so there is no conflict over available resources.

Recommended Hardware Configuration

The minimum hardware requirements vary based on institution size. The bank may opt to increase specifications to answer extra needs, for example more hard drive space. The Statements Server creates batches of data equivalent to a maximum of 1000 statements per batch. Each individual batch has a maximum hard drive footprint of approximately 500 MB.

Institutions that plan to maintain a large volume of statement data online will require more hard drive capacity than those which utilize near-line or offline storage more extensively.

Banks from $300 Million to $1.3 Billion in Assets

The following information summarizes the Recommended Hardware Configuration for the installation of FIS Statements Server for Banks between $300 Million in assets to $1.3 Billion in assets.

- Dual Intel Xeon 2.6 GHZ/512K Cache, or equivalent
- 3 GB DDR SDRAM Memory
- Standard Keyboard and mouse
- Optional monitor depending on server setup
- 4 – 128 GB high performance SCSI Hard drives
- RAID 5 Configuration
- 3.5 inch, 1.44 MB Floppy Drive
- CD-R/RW or DVD-R/RW Drive
- 1 (or more) 100Mbps (or greater) Ethernet adapter
- DLT Tape 80/120 GB Tape Drive Unit
- Tower Casing or Rack mount configuration depending on server setup.
- Non-Redundant Power Supply with Uninterrupted Power Supply

Banks up to $300 Million in Assets

The following information summarizes the Recommended Hardware Configuration for the installation of FIS Statements Server for Banks up to $300 Million in assets.

- Intel Xeon 2.4 GHZ/512K Cache, or equivalent
- Optional second Intel Xeon 2.4 GHZ/512 Cache, or equivalent
- 2 GB DDR SDRAM Memory
- Standard Keyboard and mouse
- Optional monitor depending on server setup
- 3 – 128 GB high performance SCSI Hard drives
- RAID 5 Configuration
- 3.5 inch, 1.44 MB Floppy Drive
- CD-R/RW or DVD-R/RW Drive
- 1 (or more) 100Mbps (or greater) Ethernet adapter
- DLT Tape 80/120 GB Tape Drive Unit
- Tower Casing or Rack mount configuration depending on server setup.
- Non-Redundant Power Supply with Uninterrupted Power Supply

Note: *For banks above $1.3 billion in assets, please contact your FIS Banking Solutions Account Executive for a detailed configuration.*

Software Requirements

- Windows Server 2003.
- Symantec Antivirus SMB 8.0 or later
- SQL Server 2005 (with the latest service packs and security patches)

Software Recommendations

- Optional Veritas Backup Executive Enhanced Power Suite (Open file option, SQL Agent)
- Uninterruptible Power Supply (UPS) safe shutdown software for power-loss management

Bankway SQL Server

Beginning with Service Level 8, all Bankway customers have the option to utilize a SQL database in lieu of MSDE, SQL Express, and Microsoft® Access databases. A SQL server requires additional licenses, whereas MSDE, SQL Express, and Access do not require additional licenses. Microsoft® SQL Server™ 2005 can be configured to automatically manage its disk usage, send notifications upon encountering error conditions, and etc. Bankway users will experience slightly improved performance with a properly configured SQL server, but otherwise will not notice any differences.

The databases that control the presentations and business tasks in Bankway are maintained by software installed on each Data Server. Each Data Server has a single data store that is either SQL or a combination of MSDE or SQL Express and Microsoft® Access. Since a workstation inherits the environment of the associated Data Server, these choices (reflected within the Configuration Console) can dramatically impact the cost of deployment and will influence the performance of Bankway.

Recommended Hardware Configuration

The following information summarizes the Recommended Hardware Configuration for the installation of Bankway.

> ***Note:*** *The Bankway SQL Server should be dedicated to the use and processing of Bankway only.*

- (2) Intel Xeon – 2.0 GHz Processors or higher
- GB Random Access Memory (RAM)
- SCSI hard drive controller using RAID 5 (disk striping)
- 15 GB free (usable) hard drive space
- 1.44 MB Floppy drive
- CD-ROM Drive
- SVGA Monitor (minimum resolution of 800 x 600 pixels) with 256 color resolution
- 100 Mbps Ethernet Card
- Internal Tape Backup (Optional)
- Uninterruptible Power Supply (UPS) with surge protection
- Keyboard
- Mouse

Software Requirements

The following information summarizes the minimum software requirements for the installation of Bankway.

- Microsoft Windows Server 2003
- Microsoft SQL Server 2005

Software Recommendations

- Tape Backup Software
- Virus Scanning Software
- Uninterruptible Power Supply (UPS) safe shutdown software for power-loss management

Note: *FIS recommends McAfee VirusScan or Norton AntiVirus.*

Bankway Terminal Server

The Bankway Terminal Server – located at each branch – is responsible for delivering the Bankway interface to the users via terminal emulation software. All client software processing occurs on the terminal server and is transmitted to the workstations via a network connection.

The following configurations are based upon the total number of concurrently active workstations in the server farm.

1 - 8 Workstations - Recommended Hardware Configuration

The following information summarizes the Recommended Hardware Configuration for the installation of Bankway.

- Pentium 4 – 2.0 GHz processor or higher
- GB RAM
- Internal Tape Backup (Optional)
- SCSI hard drive controller using RAID 5 (disk striping)
- 5 GB free (usable) hard drive space
- 100 Mbps Ethernet Card
- CD-ROM Drive
- 1.44 MB Floppy Drive
- Monitor
- Keyboard
- Mouse

9 - 30 Workstations - Recommended Hardware Configuration

The following information summarizes the Recommended Hardware Configuration for the installation of Bankway.

- (2) Pentium 4 – 2.0 GHz Processors
- 4.0 GB RAM
- Internal Tape Backup (Optional)
- SCSI hard drive controller using or RAID 5 (disk striping)
- 5 GB free (usable) hard drive space
- 100 Mbps Ethernet Card
- CD-ROM Drive
- 1.44 MB Floppy Drive

- Monitor
- Keyboard
- Mouse

Note: *FIS does not recommend more than 30 concurrent user connections per server.*

Software Requirements

The following information summarizes the minimum software requirements for the installation of Bankway on a terminal server.

- Microsoft Windows Server 2003
- Citrix MetaFrame 1.8 with Service Pack 3 or later or Citrix MetaFrame XP with Service Pack 3 or later
- Microsoft Office 2003 for document printing and Financial Information and Loan Collection reports

Software Recommendations

- Virus Scanning Software

  Note: *FIS recommends McAfee VirusScan or Norton AntiVirus.*

- IBM Personal Communications for Windows, IBM Client Access, or equivalent terminal emulation (for the IBM AS/400 and MVS environments)
- UniKix-supplied terminal emulation (for UNIX environments)
- It is recommended that the number of applications running on the Terminal Server be limited to those required for Bankway functionality. Additional applications can adversely affect Bankway performance.

  Note: *Terminal emulation software is not required for the operation of Bankway Windows-based capabilities. It is used to access legacy Bankway functions, also known as Green Screens.*

Bankway Thin Client

The Bankway thin client is the hardware device used to connect to the Bankway Terminal Server. Applications do not reside on the thin client and no CPU cycles are used to execute the Terminal Server applications. The only processes that occur on the thin client device are screen display, mouse and keyboard input, and access to local devices, such as validation printers. Thin client devices have a minimal built-in operating system and do not have to be upgraded as frequently as fat PCs.

Recommended Hardware Configuration

The following information summarizes the hardware requirements for a Bankway thin client device.

- 100 Mbps Ethernet Card
- SVGA video card that supports a minimum resolution of 800 x 600 and 256 colors
- Serial port

> ***Note:*** *Workstations connected to a cash dispenser and teller receipt printer require two RS-232 serial ports.*

- Monitor
- Keyboard
- Mouse

The following thin client devices have been certified with Bankway.

- Neoware 3000-E or higher
- Neoware EON E100, E300, or E500
- WYSE Winterm 3125SE
- WYSE Winterm 5125SE

Software Requirements

- IBM 5250 Terminal Emulation (AS/400 Host)
- IBM 3270 Terminal Emulation (MVS Host)
- Remote Desktop Protocol (RDP) version 5.1 or later
- Citrix ICA Client

Bankway PC Workstation

The PC workstation, also referred to as a fat PC, allows your employees to take advantage of all of the current and future features of Bankway. A PC workstation can have installed a terminal emulation program, such as the Terminal Services client or the Citrix ICA client, or can have Bankway installed locally.

Scanning workstations must have the Bankway Client and Microsoft Office installed locally. One scanning workstation in each branch must have installed the Bankway Data Server and will be the server for its respective branch.

> ***Note:*** *Workstations used for capturing images from a scanner or a Web camera cannot use a terminal services session.*

Recommended Hardware Configuration

The following information summarizes the Recommended Hardware Configuration for the installation of Bankway.

- Pentium 4 – 2.0 GHz Processor or higher
- 256 MB Random Access Memory (RAM)
- 5 GB free (usable) hard-drive space
- 1.44 MB Floppy drive
- SVGA Monitor (required resolution of 800 x 600 pixels) with 256 color resolution
- 100 Mbps Ethernet Card
- Keyboard
- Mouse

> ***Note:*** *Workstations connected to a cash dispenser and teller receipt printer require two RS-232 serial ports.*

Client Screen Resolution

The Bankway User Interface Standards are being updated to utilize a 1024 X 768 base resolution for both Windows and Browser presentations. The Browser presentation has already been designed to this standard and all changes will comply. The Windows presentation will be designed to this standard for all new Bankway software enhancements following the February 2007 Release.

Bankway continues to support resizing for various resolutions and can be presented at the recommended resolution or higher.

Software Requirements

The following information summarizes the software requirements for the installation of Bankway:

- Windows 2000 Professional with Service Pack 4 or later, or Windows XP Professional with Service Pack 1a or later
- Microsoft Office 2003 for document printing and Financial Information and Loan Collection reports

Software Recommendations

- Virus Scanning Software

> ***Note:*** *FIS recommends McAfee VirusScan or Norton AntiVirus.*

- IBM Personal Communications for Windows, IBM Client Access, or equivalent terminal emulation (for the IBM AS/400 and MVS environments)
- UniKix-supplied terminal emulation (for UNIX environments)

> ***Note:*** *Terminal emulation software is not required for the operation of Bankway Windows-based capabilities. It is used to access legacy Bankway functions, also known as Green Screens.*

Host Requirements

The host is defined as the computer system (hardware and software) in which the central database for Bankway resides. This is where core bank processing occurs. All banks differ in the amount of hardware resources necessary to support the processing of the host computer. This difference is due to many factors, including your bank's specific business requirements. Your bank needs to make a hardware capacity assessment to ensure that adequate capacity is available to support the increased capabilities of Bankway and your bank's specific business plan.

> ***Note:*** *FIS Automation Services (KAS), a subsidiary of FIS can assist your bank with hardware configuration planning. FIS Hardware and Networking Division can provide Enterprise wide storage management consulting, including sizing recommendations for disk and tape storage. Ask your FIS Strategic Account Executive to contact the Hardware & Network Services for assistance.*

Bankway operates in three different Host environments:

- IBM i/Series also known as AS/400
- IBM z/OS also known as MVS
- SUN Solaris UNIX

The network requirements for each are described in the following sections.

i/Series

Hardware Requirements

The host requires Ethernet connectivity hardware to support TCP/IP communications. Configuration options will vary depending on the hardware platform and the model of the processor. 100baseTX Ethernet is the FIS LAN standard.

Software Requirements

- Bankway release K6100000
- TCP/IP with all maintenance (Version 5.2.0 or higher)
- TCP/IP Connectivity Utilities
- IBM WebSphere MQ with all maintenance (Version 5.3 or higher)
- Configuration options for the AS/400 platform will be customized by FIS

z/OS

Hardware Requirements

The host requires Ethernet connectivity hardware to support TCP/IP communications. Configuration options vary depending on the hardware platform and the model of the processor. 100baseTX Ethernet is the FIS LAN standard.

Software Requirements

- Current release of Bankway
- z/OS (Version 1.04.0 or higher) with the following software:
- IBM TCP/IP support
- IBM ACF/VTAM
- IBM CICS Transaction Server (Version 1.3 or higher)
- IBM Language Environment
- IBM Websphere MQ for z/OS V5R3

Installation Considerations

The following information pertains to the z/OS environment:

- MQSeries customization options – Contact FIS for an in-depth review of these options.
- LE (IBM z/OS Language Environment) – This set of common services and language-specific routines provides a single run-time environment for applications written in LE-conforming language.

Run-Time Options (Batch and CICS)

The default run-time options supplied with LE may not be suitable for the application requirements at your site; therefore, you may need to customize the run-time environments (both batch and CICS) to ensure the optimum performance of your applications. The following options are recommended:

- CICS Run-Time Environment (CEECOPT Member)
  - ABTERMENC=((ABEND),OVR) – This is the default value for this member, which means that the z/OS LE abend code is produced instead of the original abend code.
  - ALL31=((OFF),OVR) and STACK=((4K,4K,BELOW,KEEP),OVR) – These options indicate that one or more routines are AMODE24.
  - STORAGE=((OO,NONE,NONE,OK),OVR) – This option ensures that the value of any heap storage allocated by the storage member is initialized to x'00'.
- Batch Run-Time Environment (CEEDOPT Member)
  - TRAP=((OFF),OVR) – This is the default value for this member, which means that the z/OS LE abend code is produced instead of the original abend code.
  - TERMTHDACT=((UADUMP),OVR) – This option causes a system dump to be created in addition to the LE dump when an abend occurs.

SUN Solaris UNIX

Hardware Requirements

The host requires Ethernet connectivity hardware to support TCP/IP communications. Configuration options will vary depending on the hardware platform and the model of the processor. 100baseTX Ethernet is the FIS LAN standard.

Software Requirements

- Bankway release K6100000
- TCP/IP Connectivity (required)
- IBM WebSphere MQ (Version 5.3 or higher)
- Configuration options for the UNIX platform will be customized by FIS

A2i Network Standards

The purpose of this A2i network standards section is to provide the network standards and specifications recommended by FIS. Please contact the FIS Hardware and Network Services division for assistance with specific hardware requirements to ensure a successful implementation of Bankway A2i at your bank.

A2i Network Standards provides information on the following topics:

- Server hardware configurations
- Required software
- Microsoft SQL Server 2005
- Telecommunications Networks

Conformance to Network Standards

The network standards provided in this guide are required and must be certified prior to the implementation of A2i at your bank. Included in the guide are the minimum and/or suggested configurations for this implementation. As individual bank networks and applications may vary, please review these standards with your bank's designated network vendor and FIS. Your bank's network vendor is responsible for researching and implementing any additional requirements for your environment, such as new applications, security requirements, etc.

> ***Note:*** *These standards are dynamic in nature and are subject to additions, changes, and deletions as both software and hardware technologies advance. Please contact your FIS account executive to ensure that you have the most current information.*

Introduction

Successful implementation of A2i requires the following items, explained in more detail below:

- A dedicated, enterprise-grade server
- Adequate Bankway host resources (DISK and batch processing window)
- A recent, Windows-based client instance of Internet Explorer
- An implementation plan

A state-of-the-technology Windows-based enterprise server will support your reporting needs well into the future. A single server will suffice in almost all cases, at least initially. If warranted by increased demands resulting from wider usage and organic growth in the number of accounts and customers, it is possible to subsequently use separate servers to house the different components of the A2i solution (i.e. databases, Composer, and SQL Reporting Services).

A2i Server Configuration Recommendations

Large volumes of data transfer may require more memory, which will require certain levels of Windows and SQL (call Network Certification for details)

- Dual 3.0 GHz Xeon processors
- 4 GB of memory
- 40GB internal hard drive for operating system and general use
- Additional disk array for Snapshot storage (see section on sizing)
- Internal DVD/CD-RW
- 1000/100 Mb Ethernet NIC

A2i Software Recommendations

- Required Software licenses:
  - Windows 2003 Standard Server
  - SQL 2005 Standard (1 license per CPU)
  - CAL's (client access licenses for Windows and SQL)
- Additional Software:
  - Antivirus software (recommended)
  - SQL Database Backup Software (optional)
  - SQL 2005 Standard Reporting Services
  - SQL Data Transformation Services
  - SQL Analysis Services
  - A2i Components (included with Bankway)

The implementation plan will help refine these general recommendations to address the specific needs of your bank. FIS can assist with an implementation plan, which must consider appropriate sizing (how much disk space, how much time, how many users, how many snapshots) and scalability, along with some standard reports and training of your users in the use of the FIS Composer and Microsoft SQL Reporting Services software.

System Capacity Configuration

Sizing the Disk

The requirements for disk space vary greatly between installations; therefore, it is necessary to establish a baseline that reflects the nature of the data of the individual bank. This is

accomplished by running host processing with the STAT mode SOUPIN parameter set. This will produce a record count that is the base for all calculations. (See Appendix B)

Host

The output of the STAT mode run of the biggest report is **a**. Multiply a times 512 to get **b**, the number of bytes in the CSJ files. Add another 5MB to account for the other files (Metadata, CACMD), this yields **e**, the actual disk space required. Multiplying **e** by a growth factor **g** (in this example 1.5) yields **H**, the recommended amount of disk space, in bytes, to be added to the host.

Formula

a * 512 = B

b + 5,000,000 = e

e * g = H

Where

- a = Record count of largest report in output from STATS mode run. (If running in a SUN environment, turn on multi-threading to create all of the groups at the same time)
- b = number of bytes in the CSJ files
- e = amount of raw data to be loaded into database
- g = Growth factor
- H = Recommended additional host disk space

Server

The summation of the output of the STAT mode run is **A**. Multiply **A** times 512 to get **B**, the number of bytes in the CSJ files. Multiple number of Presentation Groups, **C**, by 5MB to account for the other files (Metadata, CACMD). This yields **D**. Add **B** and **D** to arrive at **E** the amount of raw data in bytes that is loaded into the database. An SQL database uses disk space that is about 1.8 times the amount of the raw data. Multiply **E** by 1.8 to arrive at **F**, the number of bytes in the SQL database. Multiply **D** by a growth factor **G** to arrive at **S**, the recommended amount of disk space in bytes in the SQL database for 1 snapshot.

Formula

A * 512 = B

C * 5,000,000 = D

B + D = E

E * 1.8 = F

G = Growth factor

E * G = S

Where

- A = Summation of Record counts of all reports in output from STATS mode run. (If running in a SUN environment, turn on multi-threading to create all of the groups at the same time)
- B = number of bytes in the CSJ files
- C = number of presentation groups
- D = Number of bytes in other (metadata, CACMD) files
- E = amount of raw data to be loaded into database
- F = amount of disk space required for the SQL database
- G = Growth factor
- S = Recommended additional server disk space

Example

Assume a holding company with three Banks. Each bank is a presentation group and all Banks together is a forth presentation group. Assume a growth factor of 50%.

The STAT mode yields the following:

Bank Number	Group	STAT mode Records
1	1	2500
	2	1300000
	3	700000
	4	3800000
	5	1900000
	6	3200000
2	1	600
	2	6000
	3	400
	4	14000
	5	4000
	6	13000

Bank Number	Group	STAT mode Records
3	1	250
	2	500
	3	6
	4	80
	5	30
	6	4300

Host

The largest report is Bank 1, group 4 with 380,000 records

Formula

a * 512= b	380,000 * 512 = 1,945,600,000
b + 5,000,000 = e	1,945,600,000 + 5,000,000 = 1,950,600,000
e * g = H	1,950,600,000 * 1.5 = 2,925,900,000

The host will require an additional 3GB of storage to accommodate A2i with 50% growth.

Server

Formula

Summation of all STAT mode report records = 10,945,666

A * 512 = B	10,945,666 * 512 = 5,604,180,992
C * 5,000,000 = D	4 * 5,000,000 = 20,000,000
B + D = E 5	,604,180,992 + 20,000,000 = 5,624,180,992
E * 1.8 = F	5,624,180,992 * 1.8 = 10,123,525,786
G = 1.5	
E * G = S	10,123,525,786 * 1.5 = 15,185,288,678

The host will require an additional 15.2 GB of storage to per snapshot (see below) to accommodate A2i with 50% growth.

Number of Snapshots

The number of snapshots to be kept on line is a decision to be made by the Bank. Additional snapshots can be backed up to media such as CD\DVD and restored as required.

As a starting point assume:

- The last 10 days
- The last 5 weeks
- The last 13 months
- The last 8 quarters
- The last 7 years

Following this pattern yields about 33 snapshots as the value T.

Data transmitted from host to SQL server - The File Transfer Protocol (FTP) is initiated from within the host batch update job stream for the task of moving the captured data files to the various Enterprise Servers designated to receive a specific bank's data. The user/password for the FTP sessions (by server) is maintained by a business task within Bankway. The user id and password are stored within A2i control files. (The user id can be displayed by the business task, but the password is always obscured during maintenance activities). The FTP session will move a bank's data from the host to a special folder on a designated server. The FTP user id's privileges should be restricted and confined to the single folder. The TCP/IP network connections between the host and the Enterprise Servers should be secured from sniffing outside of the data center. There are a variety of ways to accomplish this – with hardware, for example by providing NICs (network interface cards) on the host and on the Enterprise Servers exclusively for these purposes. Other techniques using switches or virtual LANs can also be employed.

Databases built by A2i on the SQL Server - The underpinnings of A2i are Microsoft SQL Server and SQL Reporting Services. As A2i is distributed and installed in accordance with FIS procedures, the SnapShot databases are accessible to only three users: the system administrator who sets up the SQL Server (for administrative purposes such as backups, etc.); the FIS Collection Administrator application (which creates the SnapShot databases); and finally, the Reporting Services web application (via shared data sources to the SQL Server). The Collection Administrator and SQL Reporting Services will require a least privileged account (mirrored local accounts or network account) to access the SQL Server. This limits access to the SQL Server snapshot databases to a single account. As long as the Enterprise Server is located in a secure facility, the security administrator for the SQL Server password is non-blank, and access to the Enterprise Server via Windows Logon is limited to the System Administrator, the security of the SQL database meets the industry gold standard. Additional optional security measures would put a firewall in front of the Enterprise Server and configure the SQL Server port to accept incoming traffic from only the IIS Server and the Bankway host system. In addition, the IIS Server running SQL Reporting Services must be configured to only allow authorized Windows users in order to prevent unauthorized users' access to the SQL database via reporting services (to be determined by the System Administrator). The IIS Server could also be located behind a firewall, further protecting against outside access (the firewall blocks http ports) helping prevent someone hacking into the IIS Server and thereby gaining access to the SQL Server.

A2i Backup and Restoration Considerations

Backup

Backup of A2i involves two components; the underlying database infrastructure and the daily Snapshots of data.

The underlying database infrastructure is comprised of three things that need to be backed up as a set to insure continuity when restoring the server.

- The databases (use SQL Enterprise Manager)
- The Report Server key
- The Configuration Console configuration file (configuration.xml)

It is recommended that all three elements be backed up and stored together as part of the overall backup scheme. This should be done as part of the daily backup, even though files may not have changed since the last backup.

The daily Snapshots should be stored in accordance with the bank's data retention policy.

Restoration

Before proceeding with a recovery operation, be sure to have these items readily available:

- A properly configured and capable server, equipped with an appropriate backup device
- Windows Server 2003 operating system setup and installation media
- Backup device setup and installation media, if not native to the server OS
- SQL Server 2005 setup and installation media
- SQL Server 2005 Report Server
- Bankway Composer
- Bankway Collection Administrator
- The backup data set described above, including:
  - Databases
  - Report Server Key (must have password)
  - Configuration Console configuration file

Telecommunications Network

The topic of a telecommunications network is a large science and industry that is beyond the scope of this document. What follows are general guidelines. For a complete analysis of a Telecommunications Network by a qualified professional with expertise in the FIS environment, contact your FIS representative.

The Telecommunications Network is a generic term referring to the elements that allow computers to exchange data. In practice, the network allows Bankway to share your customers' database of information between users and branches. The Network is divided into two distinct sections: the LAN and the WAN.

> ***Note:*** *There are many options for Networks. This document focuses on current best practices for the FIS Bankway environment. To explore other options contact the FIS representative.*

LAN stands for Local Area Network. This is part that resides inside the Bank's facilities. Typically the Bank owns, operates and maintains the LAN. WAN stands for Wide Area Network. This is the part that connects the different locations of the Bank. Typically the Bank contracts with a Common Carrier such as AT&T, Sprint or the Local Exchange Carrier (i.e. phone company) to provide this service.

A LAN begins with cabling to every location where a computer will be attached to the network. The cables terminate at a Patch Panel in a central location, usually a wiring closet or communications equipment room. The current industry standard is Category 5 (CAT-5) which is based on EIA/TIA 568 Commercial Building Telecommunications Wiring Standard. This standard specifies cables, connectors, wall outlets, and patch panels. CAT-5 cable should be installed by a professional wiring contractor.

Operating over the cable is the data link protocol. The current industry standard, recommended by FIS, is 100baseTX Ethernet (IEEE 802.3) which operates at 100,000,000 bits per seconds. Each computer or printer connected to the network must be equipped with a Network Interface Card (NIC) capable of supporting 100baseTX Ethernet.

The computers connect to each other and the WAN via a 100Mbps Ethernet Switch, collocated with the Patch Panel. In larger installations switches may be deployed in a hierarchy with devices connected to access switches which are in turn up-linked to distribution/backbone switches.

> ***Note:*** *Some locations may be using 10Mbps Ethernet hubs. While providing similar functionality as 100Mbps switches, performance will be noticeably degraded.*

To insure data reaches the proper destination, an addressing scheme must be developed and an address must be assigned to and configured on each device in the network. FIS supports TCP/IP, which is the Internet Protocol and is the dominant standard. An IP address must be assigned to each device. The addresses must be arranged in a hierarchical manner to facilitate proper routing.

Connecting LANs, either directly or over a WAN, requires a Router. The size and configuration of the router depends on the specific network configuration.

Connecting a router to a WAN requires an interface device called a DSU/CSU. This may be integrated into the router, supplied by the Common Carrier, or owned by the bank. Often a common carrier integrates data and voice traffic over a single link. In which case the DSU/CSU must have an interface to the phone system (PBX) and must be configurable.

WAN connections come in many varieties including wireless and satellite. For Bankway the current best practice is either dedicated links, or Frame Relay. Dedicated links and Frame Relay come in standard sizes: DS0 and T1. DS0 is 64Kbps, or 56 in some implementations. T1, also termed DS1, is 1.54Mbps. There is a third option in between called Fractional T1 with bandwidth anywhere between the two. Sometimes a carrier will provision a T1 circuit to a location and use part of the bandwidth for voice and the remainder for data.

Dedicated links are just that: a fixed amount of bandwidth between two points. Frame relay is data broken into fixed length groups, called packets, and transmitted through a common network.

> ***Note:*** *Some users have been concerned that their data is mixing with the data of other companies, posing a possible confidentiality issue. The reality is that all traffic, both voice and data is mixed over the carrier's backbone. Proven multiplexing technology keeps it all separated. As in any case, encryption helps ensure confidentiality.*

Generally Frame Relay is offered with two constraints: Committed Information Rate (CIR), which is the bandwidth the carrier guarantees, and Burst Rate which is the maximum speed of the link. Frame Relay offers lower costs, plus the ability to provision a connection to multiple endpoints. This means that a Bank with multiple branches and a backup site can provision a single circuit to each location and achieve the required connectivity.

LAN Requirements

The following information summarizes the minimum hardware requirements for the Local Area Network.

- **Cabling:** Category-5, 5e or 6 to each workstation or server

  > ***Note:*** *Wireless LANs (WiFi/802.11) may be an alternative if carefully designed and implemented.*

- **Switches:** 100baseTX

  > ***Note:*** *If Network Applications such as Voice over IP or Streaming Video are to be implemented, proper Quality of Service must be configured on the switches to insure Bankway performance.*

- **Addressing:** Subnet for each branch, and at least one for the data center. Addresses should be organized in a hierarchy for summarization. Private IP addresses in the private ranges (10.x.x.x, 172.16.x.x through 172.31.x.x, 192.168.x.x) are recommended.

WAN Requirements

The following information summarizes the minimum hardware requirements for the Wide Area Network.

- **Router:** Each location requires a manageable router with an Ethernet interface to the LAN, a serial interface to DSU/CSU (or integrated CSU/DSU); plus the appropriate interface(s) to a backup link, if implemented.

  The appropriate Routing Protocol depends on topology of the network and the available bandwidth of the network. In general, RIPv2 or OSPF is best.

  Internet access requires a separate link. Best practice specifies a separate router, plus a firewall and Intrusion Detection System for security.

  CSU/DSU as specified by the common carrier. May be integrated into router, or may require interface to PBX.
- **Data Circuits:** The Speed of data circuits depends on traffic volume. Traffic other that Bankway transactions, such as e-mail, internet access, voice or video must be considered. The following guidelines address Bankway traffic only. It is important for you to evaluate your peak transaction volumes and to discuss this issue with your preferred carrier14 to establish line speeds.
- **Dedicated links:** 256K minimum
- **Frame Relay:** 256K minimum CIR to each branch. In general, the CIR to the data center should approximate the sum of the CIRs to each branch. Modeling, monitoring and tuning will provide more precise figures.
- **Backup:** ISDN BRI will supply adequate performance. Dial-up 56kb may provide minimum performance if properly tuned. Redundant links forming a partially meshed topology provides the best backup, if it can be cost justified. Other forms of redundant links, such as Internet VPN may be explored.
- **Internet Access:** Bandwidth and nature of this link depends on the Internet Service Provider.

Cash Dispensers

Cash Dispensers are designed for low-, medium- and high-volume applications, with varying security requirements. Implementation of available configurations, options and peripherals is determined by your specific operating criteria.

Cash dispenser systems deliver application-specific solutions for any environment. From the teller line and drive-up, to dialog and open environments, virtually any banking operation can be made more efficient, more secure and more profitable.

Supported Devices

- De La Rue (all models)
  - Requires De La Rue .dll software
- Diebold (Express)
  - Requires Compuflex software and security plug
- Glory (PD61)
  - Requires Compuflex software and security plug
- Arca Cash (Model 2000)
  - Requires Compuflex software and security plug
- Arca Cash (Model 2600)
  - Requires Compuflex software and security plug

Cash Recyclers

Cash recyclers are designed to deposit, count, verify, authenticate, secure, dispense and balance currency. De La Rue's proven recycling technology is recommended by FIS Banking Solutions to increase productivity, security and accuracy and also to improve client service and reduce costs.

Requirements

Lutzwolf software

Signature Pads

Signature pads are utilized for the capture, binding, authentication and verification of electronic signatures in digital documents.

Supported Devices

Signature Gems Signature Pad

Printers

Printers can be used with Bankway to print customer documentation, statements, receipts, and etc. Teller printers, network printers, and check printers can be used to add to the functionality of Bankway.

Teller Printers

Bankway supports a number of industry standard teller printers. Teller printers provided specialized functions such as receipt and check printing that complement the teller transactions without taking up the counter space of a larger general use printer.

Bankway has the ability to configure teller printers by functionality and define documents in Bank Standards to print only on certain printers. This flexibility allows banks to globally define the teller documents to be printed while permitting the workstations a wide range of printing configurations.

Teller Printer Functionality

Validation printing: Ability to print a limited number of lines on a small document such as the back of a check or a cash-in ticket. All of the supported printers share this functionality. Some of the printers, such as the Epson TM-U675, provide a specialized mechanism to print just the receipts.

- **Journal printing:** Some printers provide the option to print on a small roll of paper. Most banks using this feature use it to keep a paper trail of the tellers' transactions.
- **Check printing:** Some of the teller printers support printing bank checks. These printers have the ability to print a multi-part check form.
- **Passbook printing:** Passbook printing permits the teller to print the individual lines on a passbook. These printers are normally shared between two (or more tellers) and are typically among the larger of the teller printers.

Windows Version Available

The chart below indicates printers where a Windows version is available. These printers now support the ability to drive the printers through the Windows operating system by building a printer device in the printer collection of the operating system. This was developed use these printers in a terminal services environment where the bank does not want to use Citrix to map the com ports. The setup procedure for this is discussed in another document.

Recommendations

- Validation/Journal/Check Printer
  - FIS recommends the Epson TM-U675
- Validation/Journal Printer (where size is an issue)
  - FIS recommends the AddMaster IJ6080
- Passbook Printer/Validation
  - FIS recommends the Craden DP9

> ***Note:*** *Receipt and passbook printer drivers are built into the Bankway software. Therefore, Windows drivers are not required for the receipt printers. Refer to each manufacturer's User's Manual for paper and form requirements.*

The chart on the following page provides a general overview of the teller printers that are currently supported by Bankway.

Supported Teller Receipt Printers

Printer Model	Validation	Journal	Pass book	Printable Lines	Connection Type	Shareable	Checks or Money Orders	MICR Reader	Multiple Fonts	Impact or Inkjet	Noise Level	Size
Epson TM-U675	Y	Y	N	8	Serial	N	Pre-printed checks	Y*	Y	Impact	Medium	Medium
Epson TM-U375	Y	Y	N	8	Serial	N	Pre-printed checks	Y	Y	Impact	Medium	Medium
Axiohm 7221	Y	Y	N	14	Serial	N	Pre-printed checks	Y*	Y	Impact	High	Medium
Axiohm DH4771	Y	Y	N	17	Serial/ Parallel**	N	N	N	Y	Inkjet	Medium	Medium
Addmaster IJ2040	Y	Y	N	1	Serial	N	N	N	Y	Inkjet	Low	Medium
Addmaster IJ3160	Y	N	N	5	Serial	N	N	N	Y	Inkjet	Low	Small
Addmaster IJ6080	Y	Y	N	8	Serial	N	N	N	Y	Inkjet	Low	Small
Addmaster IJ6160	Y	N	N	8	Serial	N	N	N	Y	Inkjet	Low	Small
NCR 5021	Y	Y	N	5	Serial	N	N	N	Y	Impact	Medium	Medium
NCR 5223	Y	N	Y	Unlimited	NCR Serial	Y	Pre-printed checks	N	Y	Impact	Medium	Medium
NCR 7141	Y	Y	N	14	Serial	N	Pre-printed checks	Y*	Y	Inkjet	Medium	Medium

Printer Model	Validation	Journal	Pass book	Printable Lines	Connection Type	Shareable	Checks or Money Orders	MICR Reader	Multiple Fonts	Impact or Inkjet	Noise Level	Size
* The printer has MICR-reader capabilities, but they are not implemented at this time. ** The serial cable required is not a standard serial cable and should be ordered from the manufacturer.												
Unisys EF4270	Y	Y	N	5	Serial	N	N	N	Y	Inkjet	Low	Medium
IBM 4712	Y	Y	N	5	Parallel**	N	N	N	Y	Impact	Medium	Medium
IBM 4722	Y	N	Y	Unlimited	Parallel**	N	Pre-printed checks	N	Y	Impact	Medium	Medium
IBM 4770	Y	Y	N	5	Parallel**	N	N	N	Y	Inkjet	Low	Small
Star SP300	Y	Y	N	1	Parallel**	N	N	N	N	Inkjet	High	Medium
Craden DP6/DP7	Y	N	Y	Unlimited	Parallel**	Y	N	N	Y	Impact	High	Medium
* The printer has MICR-reader capabilities, but they are not implemented at this time. ** The serial cable required is not a standard serial cable and should be ordered from the manufacturer.												

Printer Model	Special Settings
Epson TM-U675	Flow Control -Hardware
Epson TM-U375	Flow Control -Hardware
Axiohm 7221	Flow Control - Hardware

Printer Model	Special Settings
Axiohm DH4771	BIOS -ECP
Addmaster IJ2040	Model 864768 Rv.2
Addmaster IJ3160	
Addmaster IJ6080	
Addmaster IJ6160	
NCR 5021	
NCR 5223	Flow Control - Xon-Xoff
NCR 7141	
Unisys EF4270	Flow Control - Xon-Xoff
IBM 4712	
IBM 4722	
IBM 4770	BIOS - Bidirectional
Star SP300	
Craden DP6/DP7	Emulation Mode I

Network Printers

Network printers are typically laser printers that would be used for printing documents such as forms, agreements, statements, cash balancing reports, and etc. These printers would be shared within a branch or department.

> ***Note:*** *When using network printers with multiple trays, you will not be able to specify the tray or special setting for new account or product services documents. These documents will print from the default tray. FIS recommends the Hewlett Packard LaserJet 4050N printer or greater. This printer comes with a network card, 16 MB of memory and prints 17 pages per minute.*

Check Printing

Standard Register provides a MICR check-printing system that Bankway supports. This printing system controls a secure printing environment with the ability to produce counter checks, deposit slips, cashier's checks, and money orders.

> ***Note:*** *For information on the features and system requirements, contact Standard Register at 1-800-654-2949 or FIS at 1-800-327-1892.*

Scanners

Scanners allow for the capture of customer documentation, such as signature cards, driver licenses, Social Security cards, and etc. Capturing images of these documents allows for the quick retrieval of customer information and reduces fraud. By installing a scanner at each workstation that is used to open new accounts, your employees will be able to quickly capture documents that will be incorporated into each customer's electronic profile. After a document has been captured, it may be displayed on any workstation in your bank.

Requirements

- TWAIN-compliant flatbed scanner with a USB connection (Not handheld)
- Optical Scan resolution of 300 x 600 or greater

Web Cams

Web cams allow for the capture of customer images. Capturing pictures of your customers allows for the quick identification of customers and reduces fraud. By installing a Web cam at each workstation that is used to open new accounts, your employees will be able to quickly capture pictures that will be incorporated into each customer's electronic profile.

After a customer image has been captured, it may be displayed on any workstation in your bank. Limits, such as a withdrawal over a designated amount, may also be set that will force the display of a customer image.

Requirements

- USB Interface
- Image capture capability

Sample Configurations

The illustrations on the following pages represent sample configurations for the OS/390, AS/400 and UNIX host platforms.

Remote Network Communication

The illustrations depict a sample, minimal LAN/WAN communication network setup using frame relay to handle communication switching between the main bank and the remote branch locations. Your bank's configuration may differ, but should function similarly. It is important for you to evaluate your peak transaction volumes and to discuss this issue with your preferred network provider to establish line speeds.

You may use the following as a basic rule of measurement for WAN communications:

- **Frame Relay:** The data line speed requirement for the main location must be equal to or greater than the total data line speeds of all the Remote Branch Offices.

  Example

  If there are four branches and each branch has a 256 Kbps data line speed, the main location would need at least a 1024 Kbps data line speed. 4 Remote Branches x 256 Kbps = 1024 Kbps

- **Frame Relay:** There are different measurements for data line speed. Please be aware of the following when contracting for data lines.
- **Committed Information Rate (CIR):** The minimum bandwidth that can be provided by the Frame Relay network vendor. This is the most important rate when contracting for data lines.

- **Burst Rate:** The maximum bandwidth that may be provided by the Frame Relay network. The Burst Rate is not guaranteed and should not be used to measure the speed of the data lines.
- Extensive Internet usage on the network may adversely affect the operation of Bankway. Therefore, a separate line should be installed that is dedicated to Internet access.

Bankway Network Can Run in the Following Configurations

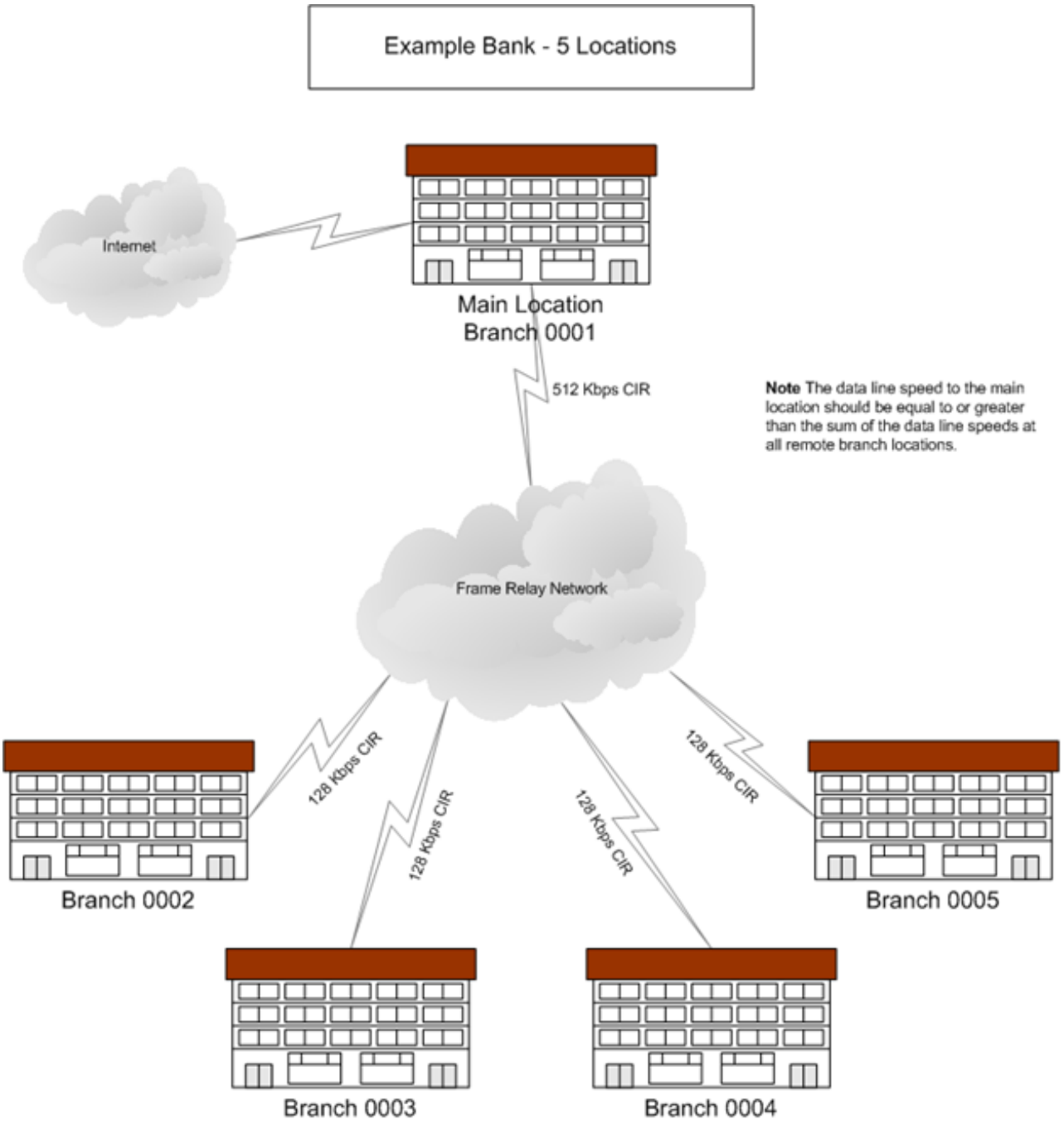
- Control Data Servers
  - Microsoft Windows Server 2003
- SQL Servers
  - Microsoft SQL Server 2005
- Terminal Servers
  - Microsoft Windows Server 2003
  - Sun Microsystems Solaris 10 - SPARC
- Terminal Services (Optional)
  - Citrix MetaFrame 1.8 with Service Pack 3
  - Citrix MetaFrame XP with Service Pack 3 or later
- Workstations
  - Microsoft Windows 2000 Professional with Service Pack 4 or later
  - Microsoft Windows XP Professional with Service Pack 1a or later
- Thin-Client Devices
  - Neoware NeoStation
- Terminal Services Clients
  - Microsoft Remote Desktop Protocol (RDP) Client version 5.1 or greater
  - WinConnectS 2.6 or greater
  - Citrix ICA Client version 4.22.079 or greater

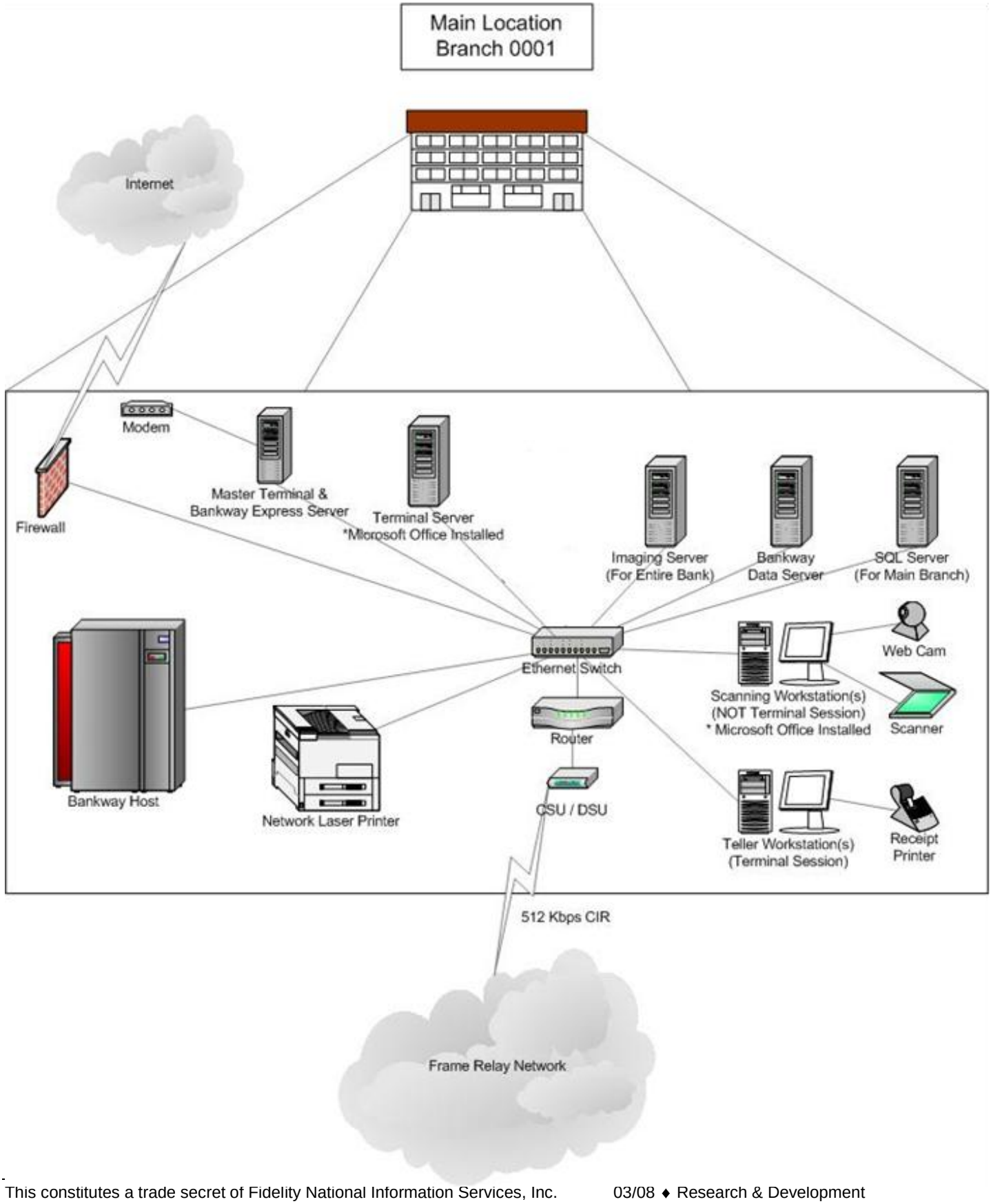
Note: *Citrix is required for utilization of teller receipt, validation, or passbook printers.*

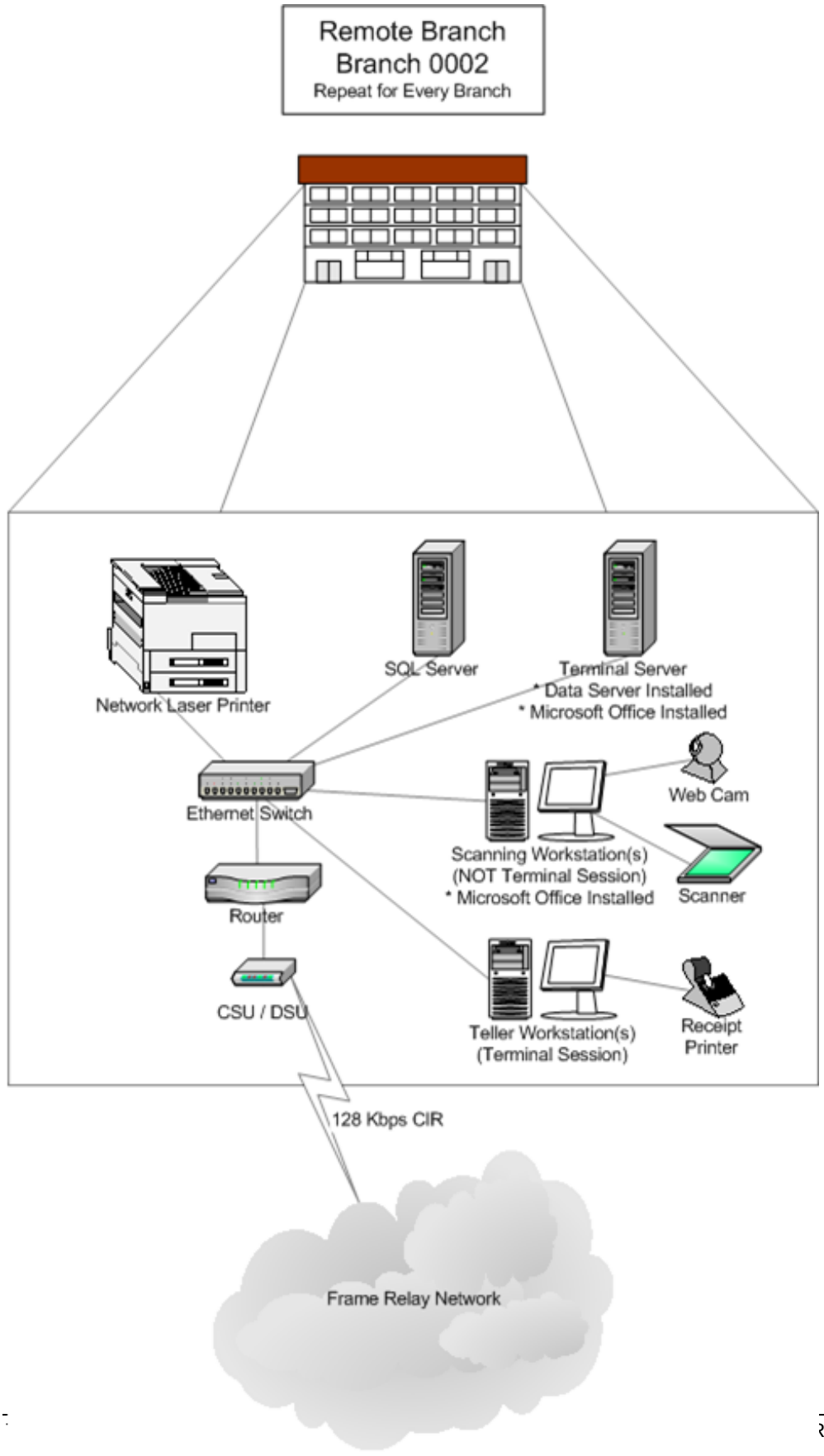
  - Microsoft Office 2003

Note: *Microsoft Internet Explorer 6.0 SP1 or 7.0 is the certified Web Browser. A full install of Microsoft Office is required on all workstations and the Master Terminal.*

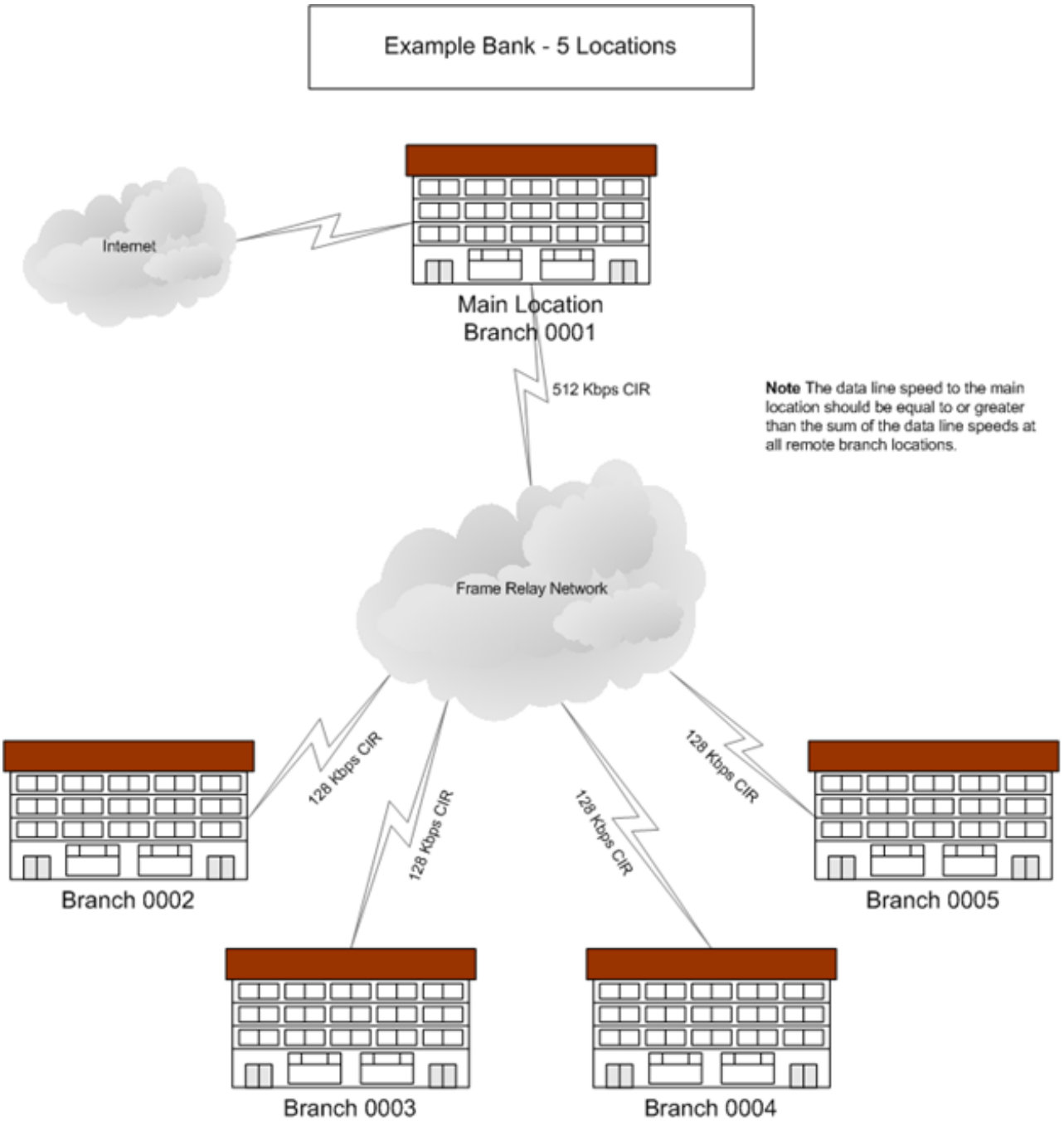
Sample of Client/Server Configuration (SQL)

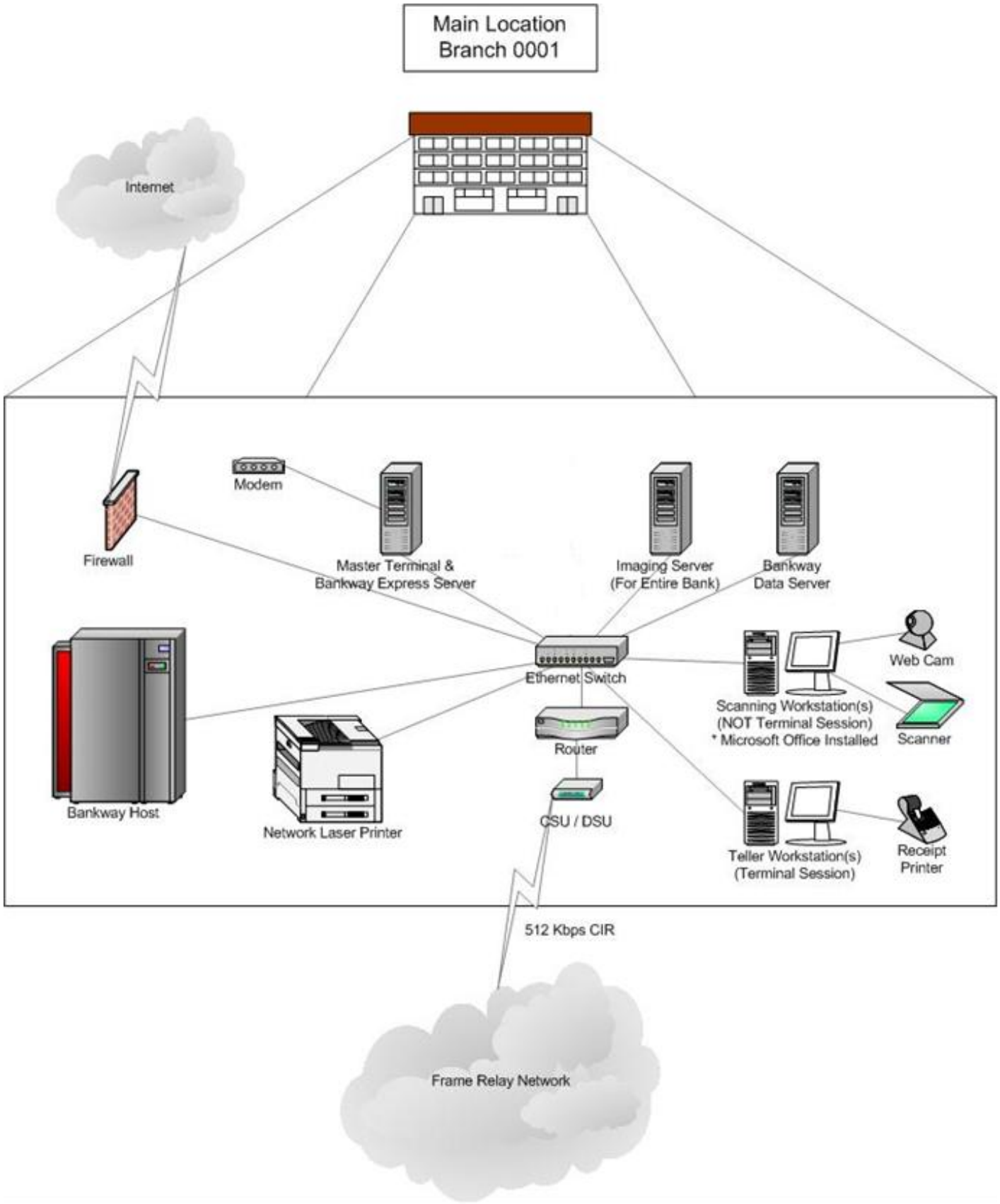

Example Bank - 5 Locations
Internet
Main Location
Branch 0001
512 Kbps CIR
Note The data line speed to the main location should be equal to or greater than the sum of the data line speeds at all remote branch locations.
Frame Relay Network
128 Kbps CIR
128 Kbps CIR
128 Kbps CIR
128 Kbps CIR
Branch 0002
Branch 0003
Branch 0004
Branch 0005

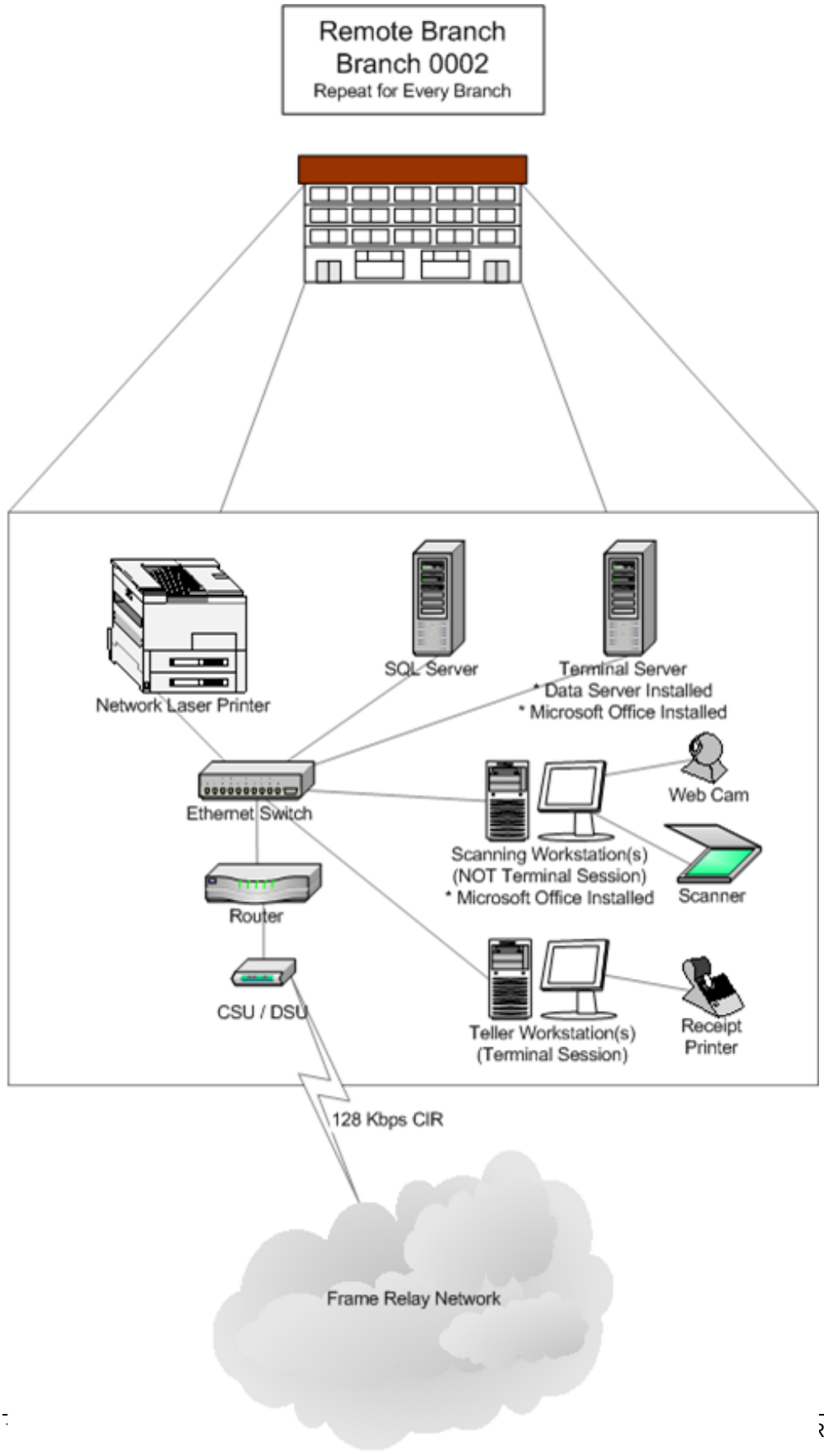

Main Location
Branch 0001
Internet
Modem
Firewall
Master Terminal &
Bankway Express Server
Terminal Server
*Microsoft Office Installed
Imaging Server
(For Entire Bank)
Bankway
Data Server
SQL Server
(For Main Branch)
Web Cam
Ethernet Switch
Scanning Workstation(s)
(NOT Terminal Session)
* Microsoft Office Installed
Scanner
Router
Bankway Host
Network Laser Printer
CSU / DSU
Teller Workstation(s)
(Terminal Session)
Receipt
Printer
512 Kbps CIR
Frame Relay Network


Remote Branch
Branch 0002
Repeat for Every Branch
Network Laser Printer
SQL Server
Terminal Server
* Data Server Installed
* Microsoft Office Installed
Ethernet Switch
Web Cam
Scanning Workstation(s)
(NOT Terminal Session)
* Microsoft Office Installed
Scanner
Router
CSU / DSU
Teller Workstation(s)
(Terminal Session)
Receipt
Printer
128 Kbps CIR
Frame Relay Network

Sample of Client/Server Configuration (No SQL)


Example Bank - 5 Locations
Internet
Main Location
Branch 0001
512 Kbps CIR
Note The data line speed to the main location should be equal to or greater than the sum of the data line speeds at all remote branch locations.
Frame Relay Network
128 Kbps CIR
128 Kbps CIR
128 Kbps CIR
128 Kbps CIR
Branch 0002
Branch 0003
Branch 0004
Branch 0005


Main Location
Branch 0001
Internet
Firewall
Modem
Master Terminal &
Bankway Express Server
Imaging Server
(For Entire Bank)
Bankway
Data Server
Ethernet Switch
Web Cam
Scanning Workstation(s)
(NOT Terminal Session)
* Microsoft Office Installed
Scanner
Router
Bankway Host
Network Laser Printer
CSU / DSU
Teller Workstation(s)
(Terminal Session)
Receipt
Printer
512 Kbps CIR
Frame Relay Network


Remote Branch
Branch 0002
Repeat for Every Branch
Network Laser Printer
SQL Server
Terminal Server
* Data Server Installed
* Microsoft Office Installed
Ethernet Switch
Web Cam
Scanning Workstation(s)
(NOT Terminal Session)
* Microsoft Office Installed
Scanner
Router
CSU / DSU
Teller Workstation(s)
(Terminal Session)
Receipt
Printer
128 Kbps CIR
Frame Relay Network

Benefits and Challenges - Terminal Server at Each Branch

Benefits

- Offline capability is available in each branch
- Each branch is independent of each other
- Not all branches will be down at the same time
- Provides a centralized location for the administration of the Terminal Servers
- Provides shadowing capabilities for Thin-Client devices
- Old workstations can be used in this environment with the use of the Citrix ICA Client application
- Network printing traffic is contained within each branch

Challenges

- More network management is required
- More terminal servers, thin-clients, and workstations are required to maintain the network
- Imaging traffic is sent across the Wide Area Network (WAN)

Benefits and Challenges - SQL Server

Benefits

- Bankway native database format
- No dependence on Microsoft Access databases
- Centralized management capabilities
- Database management tools
- SQL can be configured to inform IT personnel upon error

Challenges

- Continuous, reliable access to SQL Server required at all times
- Additional licenses required for SQL Server
- Additional training in SQL Server required for IT personnel

Remote Support Services

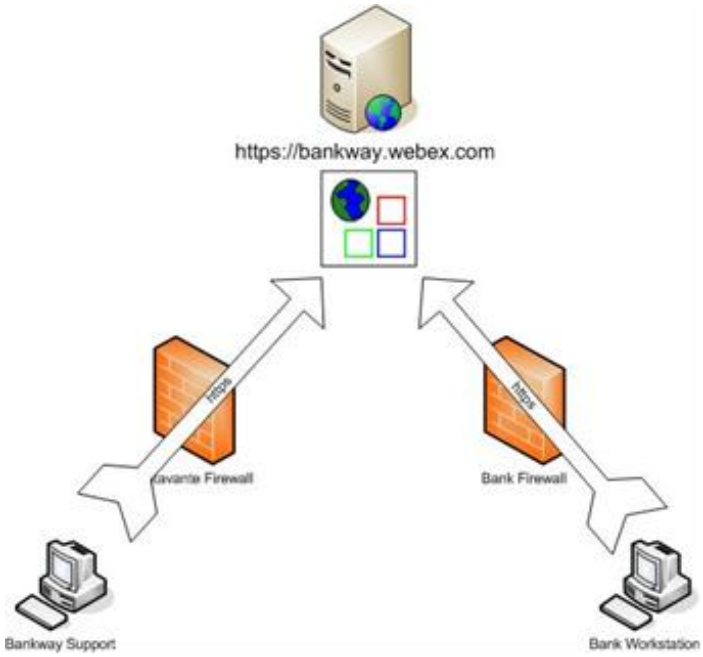
The support of Bankway software may require a FIS employee to access remote customer systems to complete Bankway product customization and to diagnose and fix software problems.

- Remote support offers the following benefits:
- On-site configuration of software
- Faster resolution
- Better root cause analysis

Remote Access Standard

To provide this remote access, FIS has standardized on WebEx. WebEx is a Web based remote access product that allows remote customers to "opt in" to a support session and pass control of their desktop to a FIS support representative.

To allow a FIS support representative remote access to a workstation at the bank, the remote bank employee must browse to an HTTPS-encrypted WebEx site and join a support meeting setup by the Bankway support representative. After the session is joined, the bank employee can opt to pass control of the whole desktop or just a particular application to the support representative.



Items to be Completed before the Installation of Bankway

Network

- Install Network Cabling at all locations/branches
- Create domain directory/user structure
- Install WAN Data Lines to all locations/branches and data center
- Install routers and switches in all locations
  - Firewall
    - Open port for FIS Express

Note: *Check with your Network Certification Specialist for the port requirements.*

Host

- Install IBM WebSphere MQ v5.2 or greater
- Install all require PLUs/PLMs
- Sun Solaris – Cornerstone Installation of Host Software by FIS Systems Programmer

DNS and/or WINS

- Add FIS (Service Level 8 and later) – Host
- Add Dimension (Pre-Service Level 8) – Host
- Add DimImageServer - FIS Imaging Server

Bankway Servers

- Have the Bankway Service Level CD available
- Have the FIS Express Site Manager CD available
- Install all Terminal Servers and configure network security
- Verify that no servers are named ‘Dimension’ or ‘Metavante’
- SQL Server
  - Install Microsoft SQL Server 2005
- Master Terminal

- Meets hardware requirements
- Modem and telephone line
- Install Windows Server 2003
- Install most current Service Packs

> ***Note:*** *Check with your Network Certification Specialist for the currently supported Service Packs for Microsoft Windows and Microsoft Office.*

- Microsoft Office
  - Perform full-installation
  - Install most current Service Packs

> ***Note:*** *Check with your Network Certification Specialist for the currently supported Service Packs for Microsoft Windows and Microsoft Office.*

  - Verify Internet Access
  - Verify ability to print to a network printer
  - Verify ability to connect to Master Terminal
  - Install Green Screen emulation software (required)
  - Install SQL Express upgrade for MSDE
- Branch Servers
  - Meets hardware requirements
  - Install Windows Server 2003
  - Install most current Service Packs

> ***Note:*** *Check with your Network Certification Specialist for the currently supported Service Packs for Microsoft Windows and Microsoft Office.*

  - Install SQL Express upgrade for MSDE (If not taking advantage of SQL)
- Imaging Server
  - Meets hardware requirements
  - Install Windows Server 2003
  - Install most current Service Packs

> ***Note:*** *Check with your Network Certification Specialist for the currently supported Service Packs for Microsoft Windows and Microsoft Office.*

  - Copy 'I386' folder from Windows Server 2003 CD to local hard drive
  - Create local imaging user account, 'DimImageUser'

- Set server security policy to allow ‘DimImageUser’ to log on locally

Workstations

- Microsoft Windows 2000/XP
  - Add 'Domain Users' to the local 'Administrators' Group
  - Install most current Service Packs

  Note: *Check with your Network Certification Specialist for the currently supported Service Packs for Microsoft Windows and Microsoft Office.*

- Microsoft Office
  - Perform full-installation by selecting 'Complete' or 'Run all from my computer'
  - Install most current Service Packs

  Note: *Check with your Network Certification Specialist for the currently supported Service Packs for Microsoft Windows and Microsoft Office.*

  - Install Green Screen emulation software (optional)
  - Physically install teller printers – Do not install Windows printer driver
  - Verify ability to print to a network printer

Networking Solutions

FIS can provide your bank with the required network design, installation, and support for Bankway.

We provide the following services:

- Analysis of your bank's current environment
- Network design
- Hardware planning and acquisition
- Multi-hardware vendor flexibility
- Installation of network and associated software
- Security
- Single point of contact for network issues and equipment maintenance

Please contact your account manager for more information regarding the above listed services.

Terminal Server Application Standards

This section describes how applications are integrated and run in a Windows Terminal Server environment. Microsoft has developed a series of processes that allow applications not written specifically for the Terminal Server environment to be executed successfully

Installation Environment

Microsoft Windows Terminal Server differentiates between applications installed specifically for the current user and applications that will be made available to all users. To separate these two installation processes, Windows forces you to physically change the installation mode when installing an application for all users. If applications are installed using the control panel's "Add/Remove Programs" icon, you will receive a prompt about the availability of the application.

When installing without the use of "Add/Remove Programs", the mode must be switched using the command prompt and the following commands.

change user /execute	Sets the installation mode to run programs or to install for only the current user. This is the default mode at system start-up.
change user /install	Sets the installation mode to install for all users.
change user /query	Displays the current installation mode.

While in the multi-user install mode, any registry changes made to the HKEY_LOCAL_USER registry key will be replicated for all users.

Application Compatibility Scripts

Because many applications expect access to individual configuration files, such as .INI files, Microsoft has designed a method of creating components for individual users. This is provided in the form of compatibility scripts that are executed for every logon to the terminal server. These scripts make sure that each user gets these user-specific configuration files.

When logging on, every user has their home drive mapped to a specified drive letter. This drive letter then becomes the user's root directory. If an application requires an .INI file in the Windows directory, the compatibility script for that application would instead check for the existence of the file in the user's home directory. If the file is not present, the script creates the directory and copies the .INI file. In this fashion, individual user settings can be maintained separately. The home drive mapping is configured in the following script file.

Server 2003 - %SystemRoot%\Application Compatibility Scripts\RootDrv2.cmd

Where: %SystemRoot% = C:\WINDOWS

During the user logon process, the following scripts are executed in sequential order.

%SystemRoot%\System32\Usrlogon.cmd	System logon scripts. Creates profile mount point. Sets up the %RootDrive% variable that is referenced in all of the compatibility scripts.
%SystemRoot%\System32\Usrlogn2.cmd	Application compatibility logon scripts. Calls each individual application script.

In addition to these above scripts, each application has its own customized script located in the "%SystemRoot%\Application Compatibility Scripts\Logon" directory.

Typical Application Scripts	Description
PComUsr.Cmd	Personal Communications compatibility script

To assist in creating these compatibility scripts, Microsoft has supplied a number of commands that can be used to manipulate files and the registry. These files are located in the "%SystemRoot%\Application Compatibility Scripts" directory.

Below is a brief summary of the commands.

- ACiniupd.exe - Used to update INI files
- ACRegL.exe - Used to update registry keys
- ACSR.exe - Used to search and replace text in files
- Regini.exe - Used to update registry

Terminal Server User Policies Standards

Introduction

Windows policies are used to enforce particular desktop and security standards for users logging onto the Terminal Server. These policies standardize the look and feel of the desktop as well as restrict and enforce user options. This section describes the suggested policy settings in the Bankway Terminal Server environment.

> ***Note:*** *The following is provided for informational purposes only and does not necessarily contain all required steps to secure your network. Please consult with your networking vendor for additional information. FIS does not configure Windows policies. It is the responsibility of the bank's desired network vendor to configure Windows policies and security.*

Standard

Windows policies are configured using the Group Policy Snap-in.

The following table contains the policy settings that should be set for the "Domain Admins" group:

Item	Setting
All Options	No Limits (Default Settings)

Map the User Root Directory

Objective

This procedure ensures that users have a mapped drive to the user root directory. This mapping is set in the "%SystemRoot%\Application Compatibility Scripts\RootDrv2.cmd" script.

Prerequisites

- Windows Terminal Server installed with licenses
- Citrix MetaFrame 1.8 or MetaFrame XP installed with product and connection licenses
- Administrator password

Procedure

1. Log-on to the Terminal Server as "Administrator."
2. Use Windows Explorer to find the "WINDOWS" (Server 2003) directory.
3. Use the "Find" function to locate the "RootDrv2.cmd" file. Does the "RootDrv2.cmd" file exist?
   - Yes - Skip to step 11.
   - No - Continue with step 4.
4. Use the "Find" function to locate the "CHKroot.cmd" file.
5. Execute the "CHKroot.cmd" file by double clicking on it. This will create the RootDrv2.cmd" in the "WTSRV" directory.
6. Use the "Find" function to locate the "RootDrv2.cmd" file.
7. Open the "RootDrv2.cmd" file for editing and locate the "Set Root Drive" entry.
8. Add the desired drive letter and the colon symbol to the end of the statement.

   Example

   Set RootDrive=W: (where "W" could be any drive letter)
9. Save the changes and close the file.
10. Skip to step 15.
11. Open the "RootDrv2.cmd" file for editing and locate the "Set Root Drive" entry.
12. Verify that the "Set Root Drive" entry contains a drive letter.

Example

Set RootDrive=W: (where "W" could be any drive letter)

13. Is the "Set Root Drive" entry complete?
    - Yes - Continue with step 14.
    - No - Go back to step 8.
14. Save the changes and close the file.
15. This procedure is complete.

Appendix A - Establish a WebEx Session

Objective

Use this procedure to establish a WebEx Support Center Session for Demo or support services.

Prerequisites

- A valid sign on for WebEx
- Internet Access

Procedure

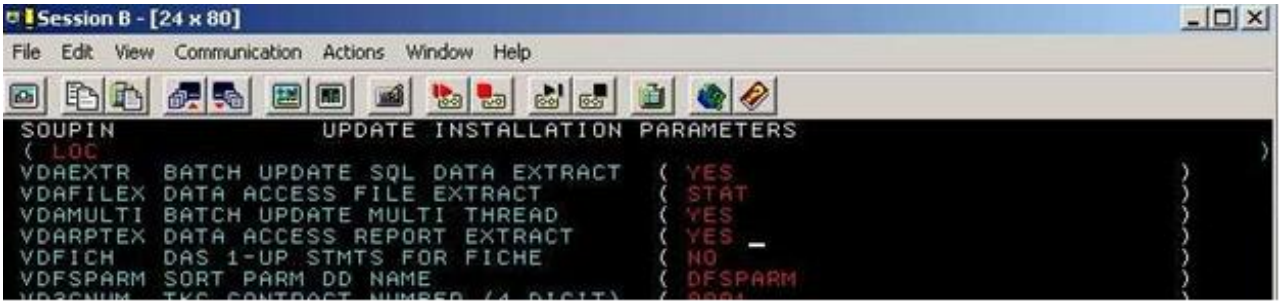
1. Open Internet Explorer and type **bankway.webex.com** in the address URL.
2. Click **Log In**, located in the upper right-hand corner.
3. Enter your FIS Banking Solutions WebEx Login ID and password and click **Log In**.
4. Select the *Support Center* tab.
5. Click **Start a Support Session**.
6. Notate the *Remote Support Session Number* and ask the customer to follow the procedure *Connect to a FIS Banking Solutions Webex Support Center Session*.
7. Alternatively, the customer can be sent an email containing a link to the support center session by clicking **Invite**. The *Invite Users* screen appears.
8. Select either *Customer* or *Support Representative* to invite the attendees by e-mail and type their name and e-mail address. After the customer joins the session, their information appears in the *Customer Information* box.
9. Show the remote customer your desktop by clicking **Share View** on the *Desktop* tab, if necessary.
10. Click **Request View** or **Request Control** and then click **OK** to view or request control of the remote customer's desktop.
11. The customer will also be prompted, and once they acknowledge the request, the session continues. A teal screen appears briefly appears as your desktop session is shared.
12. Click on the **Sharing** icon in the top right-hand corner of your display and select *Stop Desktop Sharing* when you are finished.
13. Click **End Session**.

Security Offered by the WebEx Session

- The WebEx session is invoked only from within a Web browser and cannot be started independently.
- The WebEx session is digitally signed by Verisign.
- No session data is stored on the WebEx Network.
- It is entirely dependent upon connections established on a session-by-session basis with the WebEx Network.
- Performs a proprietary encoding process that encodes all shared data.
- Encrypts all presentation sharing content using the AES encryption standard.
- Encrypts the connection to the WebEx Network using the 128-bit SSL encryption standard.
- Provides a visual identification of every attendee in the meeting.
- Has the option of recording the WebEx session to the bank's computer to satisfy audit requirements.

Appendix B - VDA SOUPIN Parameters

The "VDA" SOUPIN parameters displayed in this example are the ones used for A2i:


Session B - [24 x 80]
File Edit View Communication Actions Window Help
SOUPIN UPDATE INSTALLATION PARAMETERS
(LOC)
VDAEXTR BATCH UPDATE SQL DATA EXTRACT (YES)
VDAFILEX DATA ACCESS FILE EXTRACT (STAT)
VDAMULTI BATCH UPDATE MULTI THREAD (YES)
VDARPTEX DATA ACCESS REPORT EXTRACT (YES)
VDFICH DAS 1-UP STMTS FOR FICHE (NO)
VDFSPARM SORT PARM DD NAME (DFSPARM)

- The 1st value (VDAEXTR) tells the system whether to run during BATCH.
- The 2nd value (VDAFILEX) tells the system to extract the data files. If this is STAT, it will simply do the counts and display the results to the console.
- The 3rd value (VDAMULTI) tells the system if we are going to multithread A2i on the Host. This is only available on the SUN platform.
- The 4th value (VDARPTEX) tells the system if we are going to capture the Bankway reports during BATCH.